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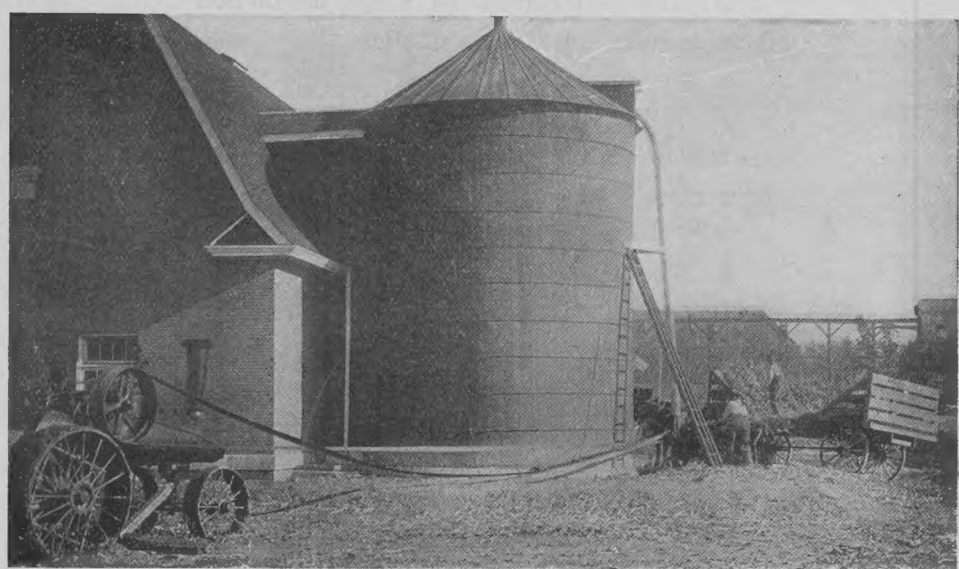
WINNIPEG, CANADA, SEPTEMBER, 1925

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EXTENSION BULLETIN No. 79
Superseding Extension Bulletin No. 68

MAKING SILAGE IN MANITOBA



Filling the Stave Silo at the Agricultural College.

By T. J. HARRISON
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Manitoba Agricultural College
WINNIPEG, MANITOBA

Published by authority of Hon. A. Prefontaine, Minister of Agriculture and Immigration

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Do not throw this away; if of no value
to you, pass on to someone else who
may be interested in the subject.

Summary

1. Silage can be produced economically in any part of the province.

2. The development of silage production depends upon the making of silos.

3. With the advent of the trench silo these are not beyond the means of the average farmer.

4. The crops best suited for ensilage production are corn, sunflowers and oats. Where corn can be grown in the southern part of the province, it will be found to give best results. In the northern portion of the province sunflowers and oats can be used.

5. There is now, therefore, no place in the province where good silage crops cannot be grown.

MAKING SILAGE IN MANITOBA

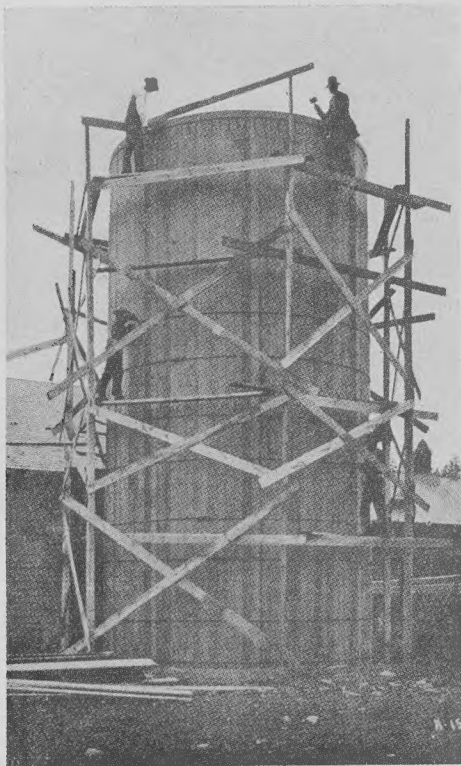
The increase in the production of silage in Manitoba has depended more upon the making of silos than it has upon the availability of crops. In the older states to the south, and especially in the dairy districts, the silo is now one of the most important, profitable and practical adjuncts of the farm. In Manitoba it is past the experimental stage, having proved well adapted to our climatic conditions. The farmers who have had the most experience are the most enthusiastic advocates.

* THE SILO

There are two classes of silos,—the upright and the underground.

UPRIGHT SILOS

Upright silos are the most common. They are built of wood staves, 2x4 scantling, solid concrete; hollow tile, concrete slabs or brick. In the preservation of silage, almost any building material will give satisfactory results, if the silo is made air-tight.



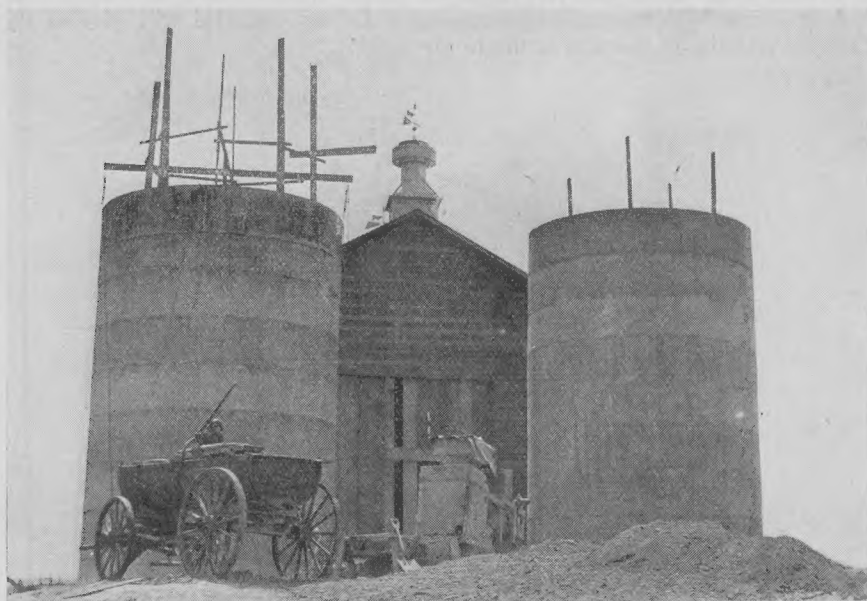
Erecting a Stave Silo.

*The Manitoba Department of Agriculture has published two bulletins on the making of silos. One of these, "Silo Construction," is mainly concerned with telling how to build upright silos. The other bulletin, named "The Trench Silo," explains in detail the way to make and use trench silos.

The *wood stave silo* is built of staves held in place by iron or wood hoops. When empty it requires attention to prevent its blowing down and to keep the hoops tight; and, when filling, to keep air-tight and prevent hoops from breaking. In the past, however, it has been the cheapest to construct, but, with high lumber prices, it is a question if the concrete type is not cheaper.

The *crib silo* is built of 2x4 scantling in the form of an octagon. The scantlings are spiked together, one on top of the other, similar to the way the bins are built in the country elevators. To give a smooth surface inside, to facilitate even settling of the silage, the silo is then lined with flooring, nailed on perpendicularly. This type is more substantial and durable, but is more expensive, than the stave silo.

The *solid concrete silo* is built with about a six-inch solid concrete wall. The difficulty in building this type is the necessity for forms.

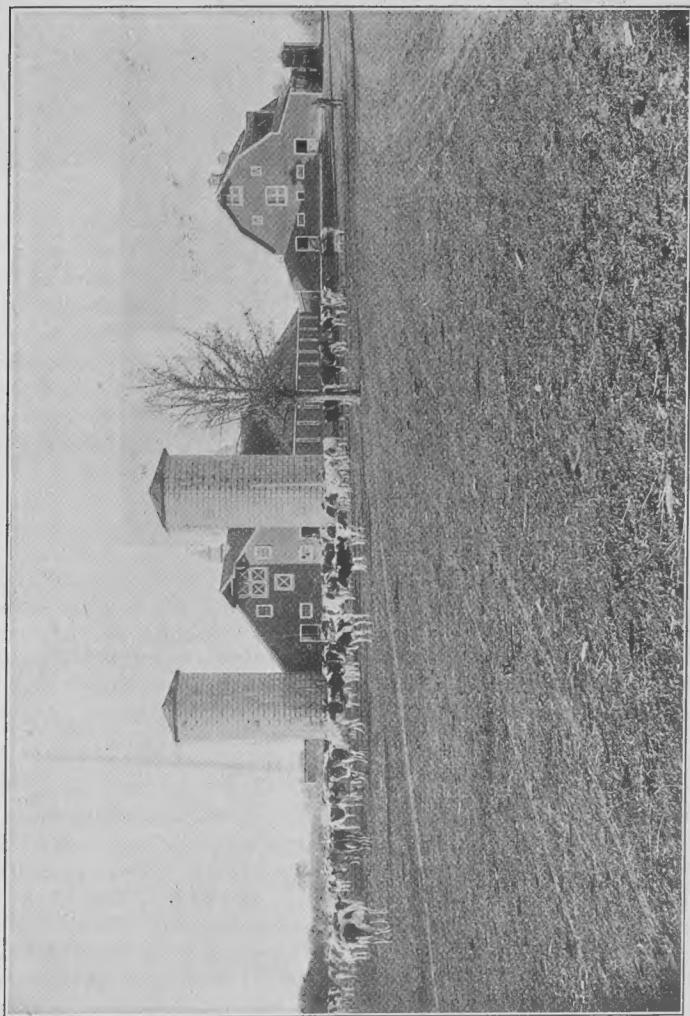


Erecting a Solid Wall Concrete Silo.

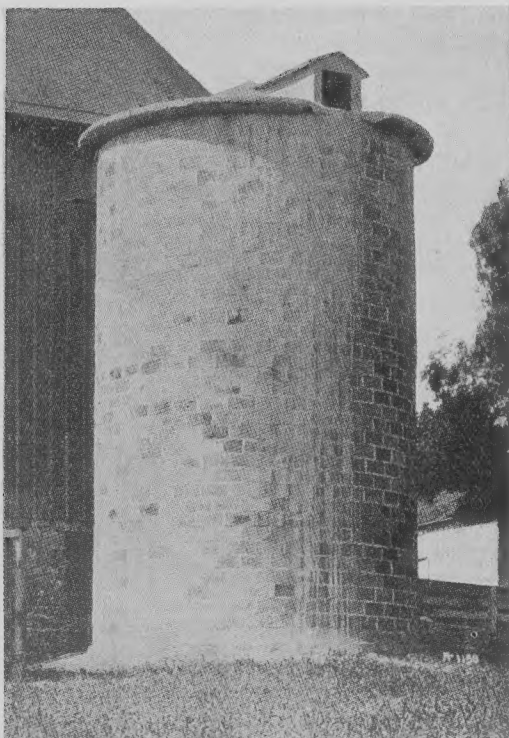
These can be built of wood on the farm, but, if many silos are to be constructed in the district, the purchase of special steel forms and special derricks will be a good investment. In the past this silo was considered more expensive than the former two; but probably it is now the cheapest.

The *concrete slabs* are usually manufactured at some central plant and shipped to the farm ready to erect. Up to the present all slabs used in Manitoba have been imported, and, consequently, have been very expensive.

The *brick silo* is lined with cement. It is about equal to the solid wall in durability. The cost will depend largely on the local price of the brick.



Concrete slab silos used on a dairy farm near Winnipeg.



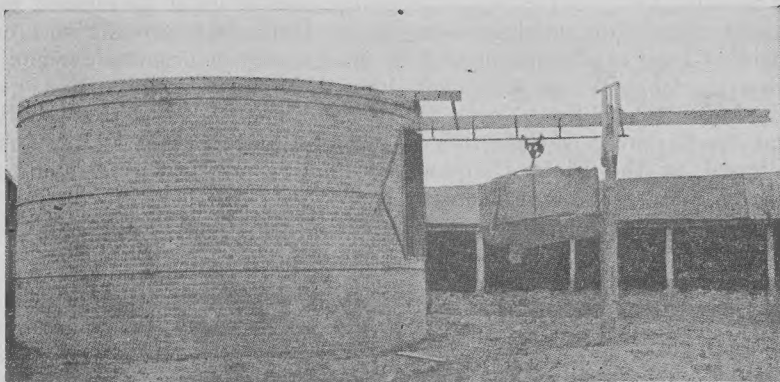
Hollow Tile Silo.

The *hollow tile silo* is one of the most recent developments in silo construction. It is built of 4x8x12 or 5x8x12 hollow clay block tiles. This type is common in the dairy areas of United States.

UNDERGROUND SILOS

The *pit silo*, as the name would indicate, is set in the ground. This type cannot be used to advantage in soils where the permanent water level comes within ten to fifteen feet of the surface. Where pit silos can be used, they require little outlay of money, as most of the work is the excavating, and this can be done by the farmer himself. They are made by first building a concrete curb, which extends three feet below the surface of the ground and four feet above. This wall should be six inches thick and the curb twelve to fifteen feet in diameter. After this is done, excavate the inside of the curb and plaster on the earth wall with one-half to one inch of concrete. The concrete for the plaster should be made of about one part of sand to one part of cement.

The *semi-pit silo* is recommended where it is not feasible to go down twelve feet or more into the ground. It consists of excavating from five to ten feet and building above this a solid concrete or stave silo about twenty feet high.



Semi-pit Silo bricked above ground.

The *trench silo* has become very popular in Western Canada. This type of silo consists of a trench about 8 feet deep, 16 feet wide, and as long as desired, depending upon the number of animals to be fed. Many silos of this type are now in use in Manitoba, and all are reported as giving good results. The cost of construction is low because most of the work can be done by the farmer in his spare time. The excavating can be done with a team and scraper.

SILAGE CROPS

Almost any farm crop can be ensiled; but the quality of ensilage from various crops differs. Several years ago the Field Husbandry Department of the Manitoba Agricultural College began to experiment with crops for silage production. Practically all classes of crops were tried. In deciding the value of these crops, five factors were taken into consideration:—

1. The Yield;
2. The Succulence;
3. The Palatability;
4. The Odor and Flavor;
5. The condition in which the crop left the land for the succeeding crop.

The result of this experiment was to narrow down the crops for Manitoba conditions to three; namely, corn, sunflowers and oats.

CORN

In the Southern and Eastern part of the Province corn will give the best results. It produces the best quality of silage and leaves the land in the best condition for the crop succeeding it.

Varieties—Where corn is grown satisfactorily year after year, Northwestern Dent is the variety best suited for silage. Minnesota 13

may be used, but is later in maturing and has often to be ensiled in an immature condition, causing sour silage. Both these crops give a comparatively long stalk and should be grown only where the farmer has a corn binder. Where the crop has to be harvested with a grain binder, Manitoba Flint, North Dakota White Flint and Gehu will be found to be more satisfactory. The Manitoba Flint is a variety developed by the Field Husbandry Department at the Agricultural College for Manitoba conditions and will give better growth during the cool season than the other sorts because it was developed as a cold resistant corn.

Suitability of Soil—It is always desirable to plant corn on comparatively clean land, because it is expensive to cultivate on weedy land. Newly broken sod land or summer fallow gives the best results. There is no crop that will respond to manure better than corn. Rotted manure plowed under will increase the yield from one to two tons per acre. If the land is clean, corn may be planted after a grain crop. On the heavy soils fall plowing gives the best results, while on the lighter sandy soil spring plowing with immediate planting is preferable.

Planting Date—The date of planting that gives best results is between May 20th and June 10th, with the May planting superior to the June planting.

Rate of Seeding—The amount of seed to plant per acre depends considerably on the variety. For example, with Manitoba Flint, a small seeded variety, less seed will be needed than with Minnesota No. 13, a large seeded variety. The Flint corn always tends to tiller while the



This is a crop of Manitoba Flint corn grown on the Agricultural College farm. This is not a rank growing corn, but it ripens its ears early. This picture shows the corn binder in use.

Dent corn does not. Where a check row planter is used, the Flint should be planted 10 to 12 lbs. per acre, while if the Dents are used 15 lbs. or slightly over should be used. If a corn planter is not available, seed may be sown with an ordinary grain drill in continuous rows. This can be done by closing up certain spouts, allowing one to run every 36 inches. When planting in this manner, it will require about twice the amount of seed; in other words, about one-half bushel per acre.

Cultivation—After the corn has been planted, packing will insure a quick germination and leave the soil in a good firm condition for harrowing. Using the ordinary drag harrow is the cheapest method of cultivation. The harrow may be used two or three times, or until the corn is about six inches high. The harrow will pull out or destroy some of the plants. Packing the soil prevents some loss from this source, and thick planting will allow for the balance. After harrowing, the crop will require intertilling with the potato scuffler or corn cultivator.

Cutting—Corn can be harvested to the best advantage with a corn binder, but where one of these is not available the shorter corn can be grown and harvested with an ordinary grain binder.

SUNFLOWERS

Sunflowers should be used only in those areas where corn cannot be grown successfully. This will be in the North and Northwestern part of the Province. The varieties which give the best results are the Giant Russian and Manchurian. The former is later in maturing, but grows taller and produces a smaller stem than the latter.

Soil—This crop, like corn, should be sown only on land that is comparatively clean. Where heavy crops are produced, however, if the weeds can be kept down in the early stages of growth, it is usually sufficiently aggressive to maintain itself against the weeds in the later stages. In other words, it can be used as a partial smother crop. It may be sown on either fall or spring plowing. It does not, however, leave the land in particularly good condition for the succeeding crop.

Planting—The seed of this crop should be placed in rows 36 inches apart. This can be done with either a corn planter without the checking device or an ordinary grain drill arranged as for corn. The crop



Giant Russian Sunflowers on the Agricultural College farm. This crop produced 30 tons of green growth per acre.

should not be check rowed, as this open spacing would cause it to produce stems so large as to be almost impossible to harvest.

This crop may be planted any time between May 1st and May 24th. The seed should be put in about 10 lbs. to the acre, or from 6 to 8 inches apart in the row, and covered about $\frac{1}{2}$ to 2 inches deep.

Cultivation—After planting, it should be packed and harrowed, and as the sunflowers come up they may be cultivated with a potato scuffler or corn cultivator as often as necessary to keep down the weeds.

Harvesting—The crop should be harvested before it becomes too mature. When about one-tenth of the plants are in bloom or when the first blooms are in the milk or dough stage it makes the best quality of silage. The crop may be harvested by hand with an axe, with a corn binder or with a *home-made sled cutter. After cutting, the sheaves may be left lying on the ground for a day or two to dry before putting in the silo.



Cutting Oats for Silage.

OATS

Oats produce much less tonnage per acre than either corn or sunflowers. However, they make a good quality of silage, and where corn cannot be grown they may be used to advantage as a substitute.

For ensilage production any good long-strawed variety, such as Banner or Victory, can be used to advantage.

Soil and Culture—They may be planted on the land which is dirty with weeds because the crop will be cut before these weeds produce seeds, and the weeds and oats can be ensiled together. This is particularly true of such weeds as Wild Oats, Perennial Sow Thistle, Canada Thistle, etc. The clean oats, however, would probably make a better quality of silage. Where the oats are used as a weed control crop, the land may be either fall or spring plowed, depending on the weed which is causing the trouble. For the control of most of these weeds the crop should be sown as early as possible, or about the time of ordinary oat seeding, at the rate of two bushels per acre. In areas where the

*For plan of home-made sled cutter, write Engineering Department, Manitoba Agricultural College, Winnipeg.

weeds are not troublesome, the crop may be sown in drills, one, two and three unit, and used as an intertilled crop and a substitute for fallow. If weeds are bad, the cost of hand hoeing the rows will be too great. The oats should be harvested when the top grains begin to turn yellow. If the weeds are troublesome, the crop may be cut even earlier.

WEEDS

In areas where the control of weeds necessitates the cutting of the crop while green, this material could be utilized to good advantage by being placed in a silo. The weed inspector and the farmer are often at a loss to know what to do with a weedy field. If the crop were cut and ensiled, it would care for the weed seed problem and at the same time give the farmer something for his labor. The silage must not be expected to equal that from corn, sunflowers or oats.

MAKING SILAGE

The length of time to leave the crop lying on the ground after cutting will depend largely on the nature of the crop and stage of maturity. Corn in the glazed stage and sunflowers one-tenth in bloom may lie on the ground two to three days. Oats, on the other hand, should be ensiled at once.

HAULING TO THE SILO

An ordinary flat hayrack is the best outfit for hauling in the green sheaves. With corn and sunflowers it is usually advisable to set the bundles on end against the back ladder of the rack, as it is found easier to handle the sheaves at the silo when loaded in this manner.

FILLING TRENCH SILO WITH UNCUT CORN

Where a cutting box is available, the best quality of silage is made by cutting the crop into the silo. Where a cutting box is not available, and where the trench type of silo is used, the crop may be put into the silo without cutting.

The best plan of filling a silo where the material is not run through a cutting box is to have the silo sloped at both ends, so that the teams may drive through the silo. This helps in packing and makes it easier to place the sheaves. The sheaves are placed lengthwise in the silo, heads to butts. The whole secret of success in filling by this method is to have the material thoroughly packed. A good method of tramping is to drive a four-horse team backward and forward through the silo. If the horses are hitched to a land packer, this is more effective.

Addition of Water—If the corn has become at all dry, water should be applied as the silo is being filled. The material should be sufficiently moist to pack firmly. Too much water, on the other hand, will cause souring of the silage.

Covering the Silage—After the trench silo has been filled, it should be covered to prevent spoiling on the surface. This is more neces-

sary with this type of silo than with the upright, because of the great surface exposed. About 18 to 24 inches of wet straw from an old stack bottom thoroughly packed on the top of the silage is most effective.

USING SILAGE CUTTER

The Ensilage Machine—The crop having been hauled from the field to the silo, it has still to be reduced to a fine homogenous mass, so that it will pack well in the silo and be in a convenient condition for feeding. To do this, an ensilage cutter is necessary. There are several makes of these machines on the market, and they all seem to give good satisfaction. The capacity of the machine to be purchased is an important consideration. It should be large enough to do the work rapidly. The size required depends upon the rapidity with which it is desired to fill the silo and the power on hand. It is best to get a machine large enough so that everyone will be kept busy all the time. It is not wise, however, to purchase a machine that will overload the motor or engine used. The power necessary to operate the cutter will depend on the size of the machine and the rate of feeding. It is possible to feed slowly and get along with much less power than would be required with full feeding. As a rule, however, the power should be sufficient to run the cutter at full capacity and have some surplus. The power required for a cutter and blower, if a gasoline engine is used, is about one horse-power for each one inch in the cutting cylinder. A fifteen-inch cutter will require a fifteen-horse-power engine.

Length to Cut—Most ensilage cutters are so constructed that the material may be cut in lengths from one-quarter to one inch when four knives are used, or twice these lengths when only two knives are in the machine. The length of cutting practised differs somewhat with different farmers. Care should be taken in this respect, however, for the length of cut has much to do with the quality of the silage. Experience has demonstrated that the half-inch cut, or even shorter, gives most satisfactory results. The finer the crop is cut, the better it will pack in the silo; this excludes the air and at the same time increases the capacity of the silo to a considerable extent. Cattle will also eat the coarser parts of the stems cleaner, if cut fine. On the other hand, the larger the pieces, the more rapidly can the crop be run through the cutter; and with the smaller, finer varieties, it is quite possible to secure good results by cutting into three-quarters or one-inch lengths.

Distributing and Packing—The distribution of the cut corn or sunflowers, after it has been blown into the silo, is a matter that should have proper attention. If the cut material is allowed to drop all in one place and then have no further attention, the constant falling of the material in one place will tend to make that portion more solid. In an upright silo this is not nearly so important as in a trench silo. One of the best methods of distributing the silage in a trench silo is by use of a horse and slush scraper. This mixes the material well and also helps to pack it. A good method of packing is to drive a four-horse team through the silo and then back them through it; they pack much better when backing. After the trench silo has been filled it should be covered similar to where the silage is put in uncut. In an upright

silos the distributing and packing may be done by one or two men; all that is necessary is to see that the cut material is evenly distributed and to assist the settling by tramping at the sides.

Addition of Water—The practice of applying water to the cut fodder in the silo is one that has obtained to a considerable degree in the states to the south and in Eastern Canada. Under Western Canada conditions, where the crop is not likely to become too ripe, the addition of water is unnecessary except in cases where the crop goes into the silo in a rather dry condition, which may be caused by a frost before cutting or by allowing the crop to stand too long after cutting before hauling to the silo. However, the claim is made that even quite dry fodder has been successfully ensiled by adding plenty of water. The use of water assists in packing, and unless such dry material is well packed the ensilage will “fire-fang” or deteriorate through the growth of mold. The water may be added by running directly into the silo by means of a hose or by running through the blower. It is claimed that the water is more thoroughly mixed with the crop when the stream is fed into the blower.

Covering the Silage—Many devices have been tried for covering the ensiled fodder in the upright type of silo. A common practice is to run straw and oats or barley and water through the ensilage cutter until there is about a foot of this material over the surface of the silo, the idea being that the grain will germinate and form a dense root blanket over the surface. Generally speaking, however, if the corn or sunflowers has been well packed and is quite moist on the surface a small portion of this will decompose rapidly and permanently seal the surface, and the experience of most silo owners in the West is that this is the most satisfactory method.

According to some experiments, it seems to be good practice, no matter what may be the condition of the crop, to wet the material thoroughly at the top of the silo a few days after the filling is completed. Water is added to it at the rate of about ten pounds per square foot of surface, repeating the process about ten days afterwards. By this method a thick, almost impervious, layer of rotten ensilage a couple of inches thick will form on the top, which prevents evaporation of water from the silage below and will preserve all but a few inches at the top.

ROUND SILOS

Capacity of various sized Silos (round in shape), number of animals that contents will feed, and acres of corn required to fill.

Inside Diameter of Silo	Depth of Silo	Capacity of Silo		Ton Capacity	Pounds that should be fed daily		Number of animals, 30 lbs. daily	Length of feeding period		Number of animals: feeding period 6 months	Acres of corn at ten tons per acre	
		Cubic Feet			Tons	Lbs.		Number	Days		Number	Acres
10	20	1571	30	524	17	120	10	3.5				
10	24	1886	37	524	17	144	13	4.0				
10	28	2200	44	524	17	168	16	4.5				
10	32	2514	51	524	17	192	19	5.5				
12	20	2263	45	754	25	120	16	5.0				
12	24	2715	54	754	25	144	20	5.5				
12	28	3168	64	754	25	168	23	6.5				
12	32	3620	78	754	25	192	28	8.0				
12	40	4526	110	754	25	240	40	11.0				
14	20	3080	60	1028	34	120	21	6.5				
14	24	3696	66	1028	34	168	24	7.0				
14	32	4928	93	1028	34	192	27	7.5				
14	40	6160	140	1028	34	240	50	15.0				
16	24	4828	95	1340	45	144	34	10.0				
16	32	6436	129	1340	45	192	47	13.5				
16	40	8046	179	1340	45	240	65	18.5				
18	30	7637	150	1750	59	180	50	16.0				
18	36	9164	188	1750	59	216	69	19.0				
18	40	10183	230	1750	59	240	84	25.0				
18	46	11710	276	1750	59	276	100	28.0				

TRENCH SILO

Capacity of various sized Silos, number of animals that contents will feed, and acres of corn required to fill.

Depth of Silo	Depth of Silage	Width of Silo	Length of Silo	Capacity of Silo	Ton Capacity		Ton Capacity for ten-ft. Length	At 30 lbs. per day, Number of animals: feeding period 6 months		Number of animals per 10-ft. length	Acres of corn at 10 tons per acre
					Tons	Tons		Number	Number		
6	4	10	50	2000	40	8	14	3	4.0		
8	6	12	50	3600	72	14	25	5	7.5		
8	6	14	50	4200	84	17	30	6	8.5		
8	6	16	50	4800	96	19	35	7	10.0		
10	8	12	50	4800	96	19	35	7	10.0		
10	8	14	50	5600	112	22	40	8	11.5		
10	8	16	50	6400	128	25	47	9	13.0		
12	10	12	50	6000	120	24	44	9	12.0		
12	10	14	50	7000	140	28	50	10	14.0		
12	10	16	50	8000	160	32	60	12	16.0		
12	10	18	50	9000	180	36	65	13	18.0		
14	12	14	50	8400	168	34	62	12	17.0		
14	12	16	50	9600	192	38	70	14	19.5		
14	12	18	50	10800	216	43	80	16	22.0		
14	12	20	50	12000	240	48	90	18	24.0		

Note.—The different sizes are all reckoned at 50 feet long. To get capacity for each ten feet shorter or longer, subtract or add “ton capacity for 10 ft. length” in seventh column. To get number of animals that can be fed for each 10 ft. shorter or longer, subtract or add number of animals in ninth column.

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